

What is claimed is:

[Claim 1] 1. A white LED device, comprising:

a first LED die, capable of emitting a first color light;
a second LED die, capable of emitting a second color light; and
a phosphor layer disposed on at least one of the first and second LED dies, capable of emitting a third color light when stimulated by the first or second color light;
an electrode connection structure, electrically connected with electrodes of the first and second LED dies for providing electricity to the first and second LED dies; and
a light mixing structure, capable of mixing the first to third color lights to produce white light.

[Claim 2] 2. The white LED device according to claim 1, wherein

the light mixing structure comprises a transparent packaging layer enclosing the first LED die, the second LED die and the phosphor layer; and the first to third color lights are mixed through a lens effect of the transparent packaging layer.

[Claim 3] 3. The white LED device according to claim 2, wherein the electrode connection structure includes a packaging substrate that have pins electrically connected with the electrodes of the first and second LED dies.

[Claim 4] 4. The white LED device according to claim 3, wherein
the packaging substrate has a groove therein;
the first and second LED dies are disposed in the groove;
the transparent packaging layer fills the groove; and
the pins comprise:
a first pin extending into the groove, connected with one electrode of each of the first and second LED dies; and
a second pin, connected with the other electrode of each of the first and second LED dies through wire bonding.

[Claim 5] 5. The white LED device according to claim 4, wherein the transparent packaging layer comprises:

a transparent resin filled in the groove; and

a transparent glass layer disposed on the transparent resin.

[Claim 6] 6. The white LED device according to claim 2, wherein the electrode connection structure comprises:

a first electrode frame, connected with one electrode of each of the first and second LED dies; and

a second electrode frame, connected with the other electrode of each of the first and second LED dies.

[Claim 7] 7. The white LED device of claim 6, wherein
the first electrode frame has a groove therein;
the first and second LED dies are disposed in the groove, so that one electrode of each of the first and second LED dies is electrically connected to the first electrode frame;
the transparent packaging layer fills the groove; and
the second electrode frame connect with the other electrode of each of the first and second LED dies through wire bonding.

[Claim 8] 8. The white LED device according to claim 7, wherein the transparent packaging layer comprises:

a transparent resin filled in the groove; and

a transparent glass layer enclosing the transparent resin.

[Claim 9] 9. The white LED device according to claim 1, wherein the first LED die comprises a blue LED die, the second LED die comprises a green LED die, and the phosphor layer comprises a red phosphor.

[Claim 10] 10. The white LED device according to claim 9, wherein the phosphor layer is disposed merely on the blue LED die.

[Claim 11] 11. The white LED device according to claim 9, wherein the phosphor layer is disposed merely on the green LED die.

[Claim 12] 12. The white LED device according to claim 9, wherein the phosphor layer is disposed on each of the blue LED die and the green LED die.

[Claim 13] 13. The white LED device according to claim 9, wherein the phosphor layer includes a red phosphor selected from the group consisting of $\text{Sr}_2\text{Si}_5\text{N}_8:\text{Eu}^{2+}$, $\text{SrS}:\text{Eu}^{2+}$, $\text{CaS}:\text{Eu}^{2+}$ and combinations thereof.